CHAPTER 2

ACTUATION MINES

LEARNING OBJECTIVES

Upon completing this chapter, you should be able to do the following:

1. Describe the Mk 52 and Mk 55 actuation mines.
2. Describe the detection system employed in the actuation mines.
3. Describe the different operational assemblies of the Mk 52 and Mk 55 actuation mines.
4. Identify the proper planting depths for the Mk 52 and Mk 55 actuation mines.
5. Describe the operational description of the Mk 52 and Mk 55 actuation mines.
6. Describe the various mine components used to assemble the Mk 52 and Mk 55 actuation mines.

Exercise and training (ET) mines, for the most part, look and act like their service counterparts. ET mines provide activities with the means to improve their mine assembly, delivery, and countermeasures capabilities. Actuation mines are one type of ET mines, used primarily to support the total weapon concept training in exercises and in war games at sea.

ACTUATION MINE TYPES

Actuation mines are reusable configurations that are used primarily for training exercises, using an inert-loaded mine case and small explosive devices and/or pyrotechnics that are contained in the mines to provide a realism in mine delivery, for firing simulation, and as an aid in recovery operations. They provide target response characteristics identical to those of service mines of equal Mark and Mod.

Designed for testing mine countermeasures equipment and for training countermeasures personnel, actuation mines contain sensing and actuation systems identical to those in service mines but which, instead of exploding the mine, operate accessories that provide for visual indication of mine actuation, and for self-locating and recovery without recourse to divers. The different types of actuation mines are discussed in this section.

FLIGHT ACTUATION MINE

The flight actuation mine is identical to the air-laid service mines of like Mark and Mod with the additional externally attached float. The mine consists of an inert-loaded standard mine case containing service mine detection components, firing assemblies, and safety devices. The float releases a smoke signal when actuated and surfaces itself at a

preset time to allow mine location and recovery. Actuation mines use a sonar transmitter to aid in the location for recovery.

NONFLIGHT ACTUATION MINE

The nonflight actuation mine is identical to the flight actuation mine except that it does not use flight gear and is planted by surface craft.

MK 52 MODS 2 AND 5 ACTUATION MINES

Mk 52 Mods 2 and 5 actuation mines, shown in figure 2-1, are 1,000-pound, aircraft-laid, bottom, inert-loaded mines. Each Mod employs one or more detectors that respond to acoustic or magnetic influence fields of a passing ship. The Mk 52 Mod 2 mine employs a magnetic detection system, and the Mk 52 Mod 5 employs a combination of acoustic/magnetic detection systems.

The same structural, planting, arming, and detonating components are used in each Mod, with the basic difference among Mods being the type of detector or the combination of detectors used.

The mine consists of an inert-loaded mine case, tiring assembly and safety devices. and an external drill section attached to the tail of the mine case. The mine case is loaded with cement or a similar inert substance in place of the service mine's explosive main charge and does not incorporate explosives in the arming device.

Instead, the firing current (which initiates such explosives in the service mine) in the actuation mine actuates a pyrotechnic signal that surfaces to indicate mine actuation. The tail cover of the mine provides a watertight passage for the electric cable that carries the firing current that ejects the signal. A float shield on the tail of the mine houses a drill float that contains the signal. At a preset time, the float itself is freed to rise to the surface, paying out recovery line as it rises. Thus, it provides visual location of the mine with a line made fast to the mine, and enables its recovery by surface craft.

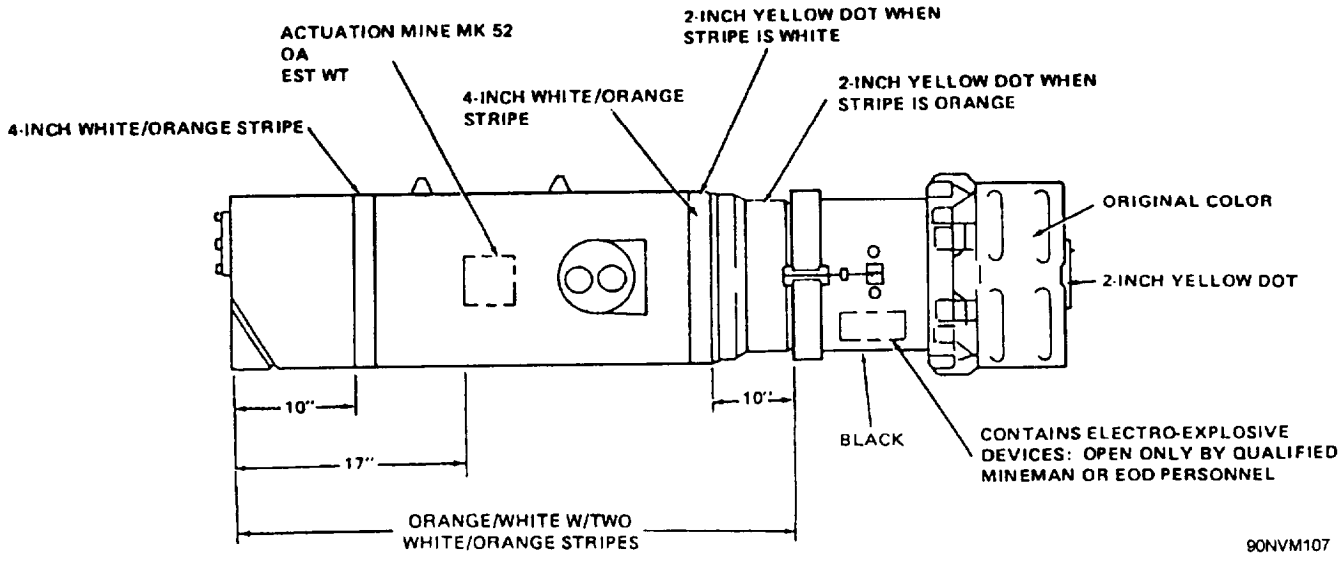


Figure 2-1.—Mk 52 actuation mine.

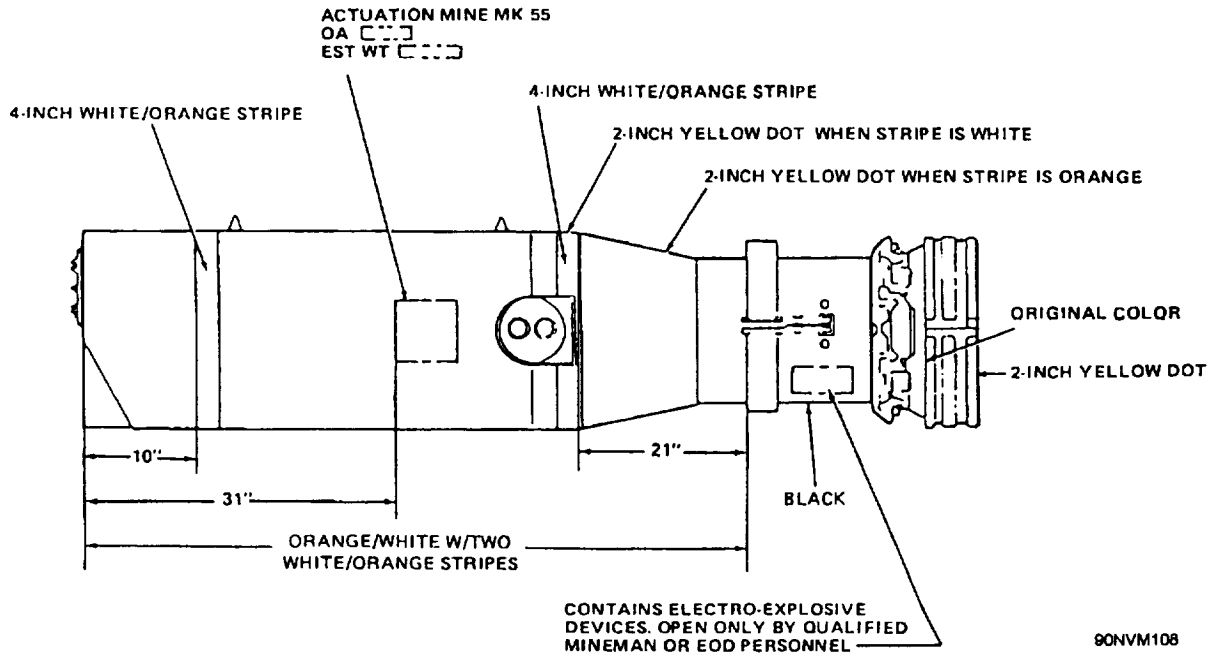


Figure 2-2.—Mk 55 actuation mine.

MK 55 MODS 2 AND 5 ACTUATION MINES

The Mk 55 Mods 2 and 5 actuation mines, shown in figure 2-2, are 2,000-pound, aircraft-laid, bottom, inert-loaded mines. The Mk 55 actuation mine is identical to the Mk 52 except that the Mk 55 is larger.

DETECTION SYSTEMS

The Mk 52 and Mk 55 actuation mines employ two detection systems. Each of the mines can be assembled with either magnetic (Mod 2) or acoustic/magnetic (Mod 5) detection systems.

MOD 2 DETECTION SYSTEM

The Mk 20 Mod 1 firing mechanism, shown in figure 2-3, is used in the Mk 52 and Mk 55 Mod 2 actuation mines. The Mk 20 is a magnetic-influence mechanism housed in a red aluminum case 4 1/2 inches high, 6 inches long, and 5 1/2 inches wide.

Externally, it has two screwdriver-operated controls (balance and sensitivity) and three connectors. The J401 and J402 connectors connect the mechanism to the other mine components. The J403 connector accommodates an attenuator plug. The attenuator plug (a separate component) receives the signal from the mine's search coil and reduces the strength of the signal going to the firing mechanism amplifier so that the mechanism does not produce looks when a small vessel passes nearby or when a target passes at a distance beyond the effective range of the mine. This reduces the chance that a mine firing will be wasted. Any one of the six different attenuator plugs can be used to produce different amounts of attenuation, ranging from no attenuation with a No. 1 plug to the maximum attenuation with a No. 6 plug. Attenuator plugs are not furnished with the Mk 20 firing mechanism, but one must be installed or the mechanism will not operate.

Internally, the mechanism consists of an amplifier and a look relay. The amplifier, which increases the strength of the input signal to close the look relay, has two main parts: an oscillator and a bridge network. The oscillator converts direct current from a battery in the mine into 115 Hz. This alternating current powers the bridge network. The bridge network is a circuit that permits the small signal received from the search coil (through the

attenuator plug) to control the large signal produced by the oscillator. In this way, a signal is produced that is strong enough to operate the look relay. The oscillator signal is put onto and removed from both sides of the bridge at exactly the same time; therefore, the bridge stays balanced. The bridge becomes unbalanced when a ship's magnetic field causes the search coil to send a signal to the bridge and is subtracted from the oscillator signal on the other side. This causes the bridge to be unbalanced. The larger the signal from the search coil, the more unbalanced the bridge becomes. When the bridge is balanced, no signal is sent to the look relay. But, when the bridge becomes unbalanced, a part of the oscillator signal is fed into the look relay. The more unbalanced the bridge becomes, the larger the oscillator signal that is applied to the look relay. In this way, the comparatively small signal from the search coil controls the amplitude of the large signal from the oscillator that is fed into the look relay.

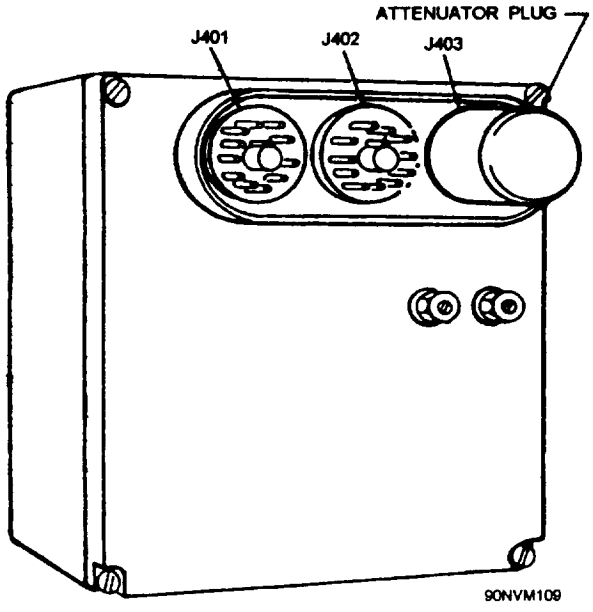


Figure 2-3.—Mk 20 Mod 1 firing mechanism.

The look relay is a switch that operates like an electrical meter in that it has a needle that is moved by an input. In this case, the input is from the amplifier. If the input from the amplifier is strong enough, it moves the needle far enough to cause it to touch an electrical contact. When this occurs, the switch closes and the firing mechanism "takes a look." When the magnetic field near the mine starts to decrease, the current from the search reverses.

When this happens, the bridge is unbalanced in the opposite direction and the signal from the amplifier reverses. This causes the look-relay needle to move in the opposite direction. When it moves far enough, it touches a second electrical contact and a reverse look is taken. Both the initial look and the reverse look are required for an actuation count or to fire the mine.

The Mk 20 firing mechanism's operation is as follows:

1. A change in the magnetic field at the mine causes a small search-coil current.

2. The attenuator plug reduces the current to one that will actuate the firing mechanism only if the ship is of the desired class and is within damage radius.

3. The amplitude of a weak signal from the attenuator is increased by the mechanism amplifier until it is strong enough to operate the look relay.

4. The look relay closes one of its two sets of contacts.

5. As the strength of the ship's magnetic field begins to decrease, the search coil current reverses direction.

6. The attenuator plug reduces the reverse current to the amplitude that will actuate the firing mechanism only if the ship is of the desired class and is within damage radius. The look relay receives a second current, which closes the second set of contacts.

7. The mine detonates (or counts an actuation) unless more than one firing mechanism is used in the mine; in which case, the mine may not be ready to detonate or to count an actuation. Under these conditions, when the look relay of the Mk 20 firing mechanism closes for the reverse look, the circuit that caused the mine to detonate or to count an actuation is only partially completed. The look

relays in all other firing mechanisms in the mine must also be closed to complete the circuit.

MOD 5 DETECTION SYSTEM

The Mk 21 Mod 0 firing mechanism, shown in figure 2-4 and used with the Mk 20 Mod 1 firing mechanism, is an acoustic detecting device used in the Mk 52 and Mk 55 Mod 5 actuation mines. The mechanism is housed in a blue aluminum case measuring 5 inches high, 6 inches long, and 3 inches wide. Externally, the mechanism has two male and two female connectors and a screwdriver-operated switch (S301).

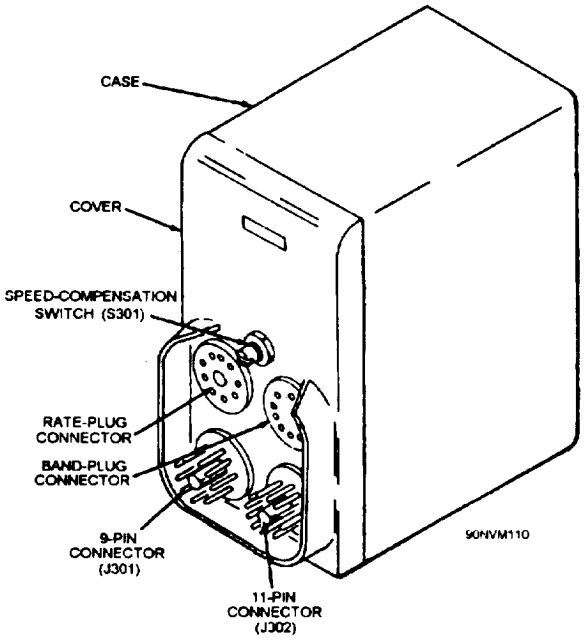


Figure 2-4.—Mk 21 Mod 0 firing mechanism.

The Mk 21 firing mechanism uses two other components: the Mk 3 Mod 0 depth compensator and the Mk 6 Mod 1 hydrophone. They are installed in the tail cover and are connected by a cable assembly.

Mk 3 Mod 0 Depth Compensator

The Mk 3 Mod 0 depth compensator, shown in figure 2-5, is used in the Mk 52 and Mk 55 Mod 5 actuation mines. It is a hydrostatically operated, electromechanical switching device that automatically adjusts the sensitivity of certain firing mechanisms by changing resistances in the detecting circuit. The compensator consists of a frame-and-bellows assembly, a switch-bracket assembly, a lever arm assembly, a stud (inlet port), a housing (cast iron), and associated electrical components.

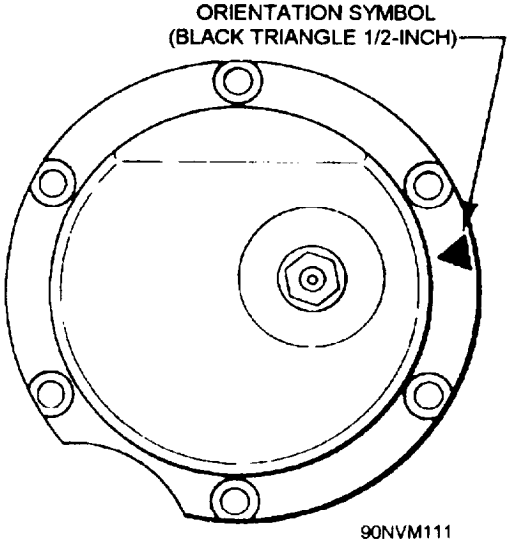


Figure 2-5.—Mk 3 Mod 0 depth compensator.

Mk 6 Mod 1 Hydrophone

The Mk 6 Mod I hydrophone, shown in figure 2-6, is connected to the Mk 21 firing mechanism by a cable assembly.

Because of the classification of the Mk 21 firing mechanism and the Mk 6 hydrophone, for further information, refer to *Mine Components D through F; Description and Class-B Criteria,* NAVSEA SW550-AA-MMI-020; and *Mine Components G through W; Description and Class-B Criteria,* NAVSEA SW550-AA-MMI-030.

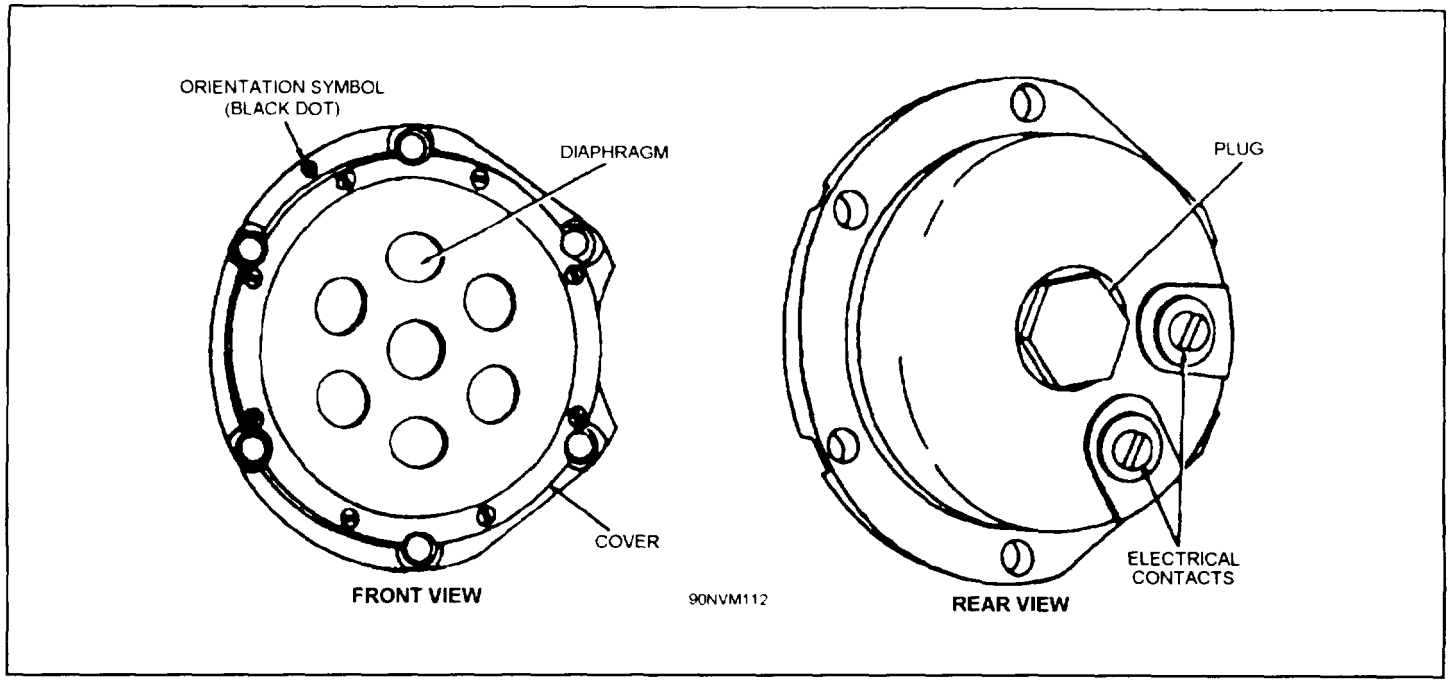


Figure 2-6.—Mk 6 Mod 1 hydrophone.

OPERATIONAL ASSEMBLIES

Whereas the Mark designation of a mine is generally distinguished by the differences in the shape of the mine case and the Mod by the difference in the firing mechanisms, the operational assemblies (OAs) denote differences in the use of flight gear. In practice. the OA to be assembled is chosen by the assembly activity, according to the planting agent, personnel, and conditions under which the mines will be planted. That OA is then specified in assembly orders that are issued to the mine assembly activity in support of the mission plans.

AUTHORIZED CONFIGURATION DATA

Actuation mines may be assembled to either one of two configurations: an all-up assemby, or a subassembly. They are discussed in chapter 1 of this volume.

AUTHORIZED OPERATIONAL ASSEMBLIES

Variations in the use of assembly-level items within an authorized mine configuration are called *operational assemblies* (OAs). An abbreviated list showing components that distinguish the authorized OAs for Mk 52 and Mk 55 actuation mines can be found in *Mines, Underwater: Actuation, Description, Assembly, and Tests,* NAVSEA SW550-AE-MMI-040.

PLANTING DEPTHS

The water depth in which an actuation mine can be planted is determined by the depth that the signaling gear will operate and the depth at which the mine can be recovered without the use of divers. Bottom conditions are also a factor in determining this depth. If the water is less than 40 feet, the bottom must be hard or have less than 1 foot of sediment or the signaling and recovery gear may fail to operate. Even in greater water depths, the maximum sediment depth on the bottom must be less than 4 feet if the gear is expected to operate reliably.

The minimum planting depth for the Mk 52 actuation mine is 25 feet, and the minimum planting depth for the Mk 55 actuation mine is 30 feet. If these mines are to be recovered without divers, they have a fixed maximum water depth of 200 feet. which is the length of the recovery line on the float.

MK 52 AND MK 55 ACTUATION MINE COMPONENTS

The components of the Mk 52 and Mk 55 actuation mines fall into two categories:

1. Components that are the same as or similar to those used in service mines.

2. Components that are unique to ET mines.

The ET components that are the same as those used in service mines include firing mechanisms, flight gear, etc. Information on these components can be found in *Mine Components A through C; Description and Class-B Criteria,* NAVSEA SW550-AA-MMI-010; NAVSEA SW550-AA-MMI-020; and NAVSEA SW550-AA-MMI-030. Information on the components unique to ET mines can be found in *Mines, Underwater: Exercise and Training; Description and Class-B Criteria,* NAVSEA SW550-AE-MMI-010. This section discusses these components and their operation.

MK 5 MOD 1 ET ARMING DEVICE

The Mk 5 Mod 1 ET arming device, shown in figure 2-7, is a hydrostatically operated mechanism. It is identical to the service version except that it contains no explosives. It is 6 3/4 inches high and 6 13/1 6 inches in diameter, and weighs 9 pounds. It comprises an extender, a hydrostatic switch, and a 10-pin connector mounted on a circular brass plate.

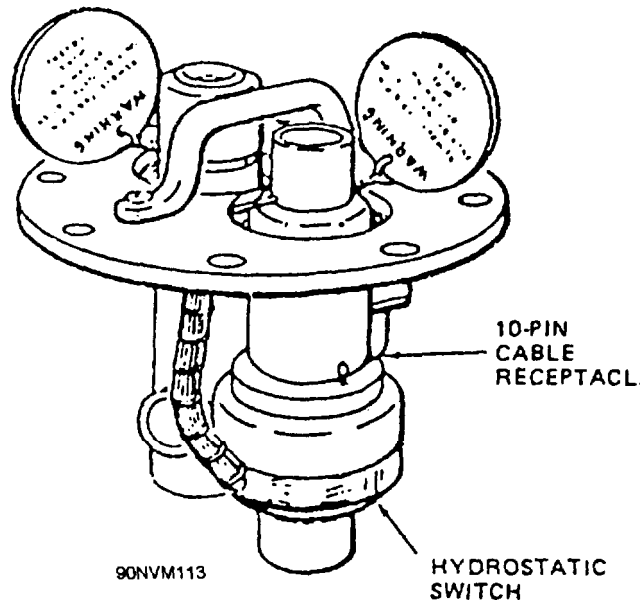


Figure 2-7.—Mk 5 Mod 1 ET arming device.

MK 21 MOD 0 CLOCK DELAY

The Mk 21 Mod 0 clock delay, shown in figure 2-8, is used to delay the arming of the mine. It is enclosed in a white aluminum housing 4 1/2 inches high, 6 inches long, and 2 inches wide. It weighs 3 pounds.

MK 27 MOD 0 SEARCH COIL

The Mk 27 Mod 0 search coil, shown in figure 2-9, consists of a 7/8-inch diameter Mumetal core rod extending the full length of the coil; 33,000 turns of No. 21 wire, wound in two equal sections; a jacket, which is a vacuum-impregnated glass cloth with polyester resin; and two special rhodium-plated terminals (jack receptacles), which accommodate the rhodium-plated cable connections. The overall length is 57 1/2 inches and the outside diameter is 2 1/2 inches. It weighs 50 pounds. A change of

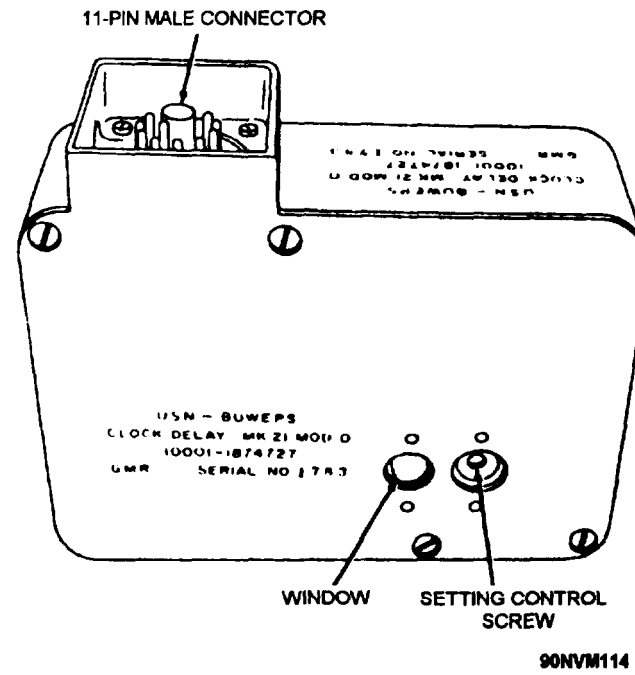


Figure 2-8.—Mk 21 Mod 0 clock delay.

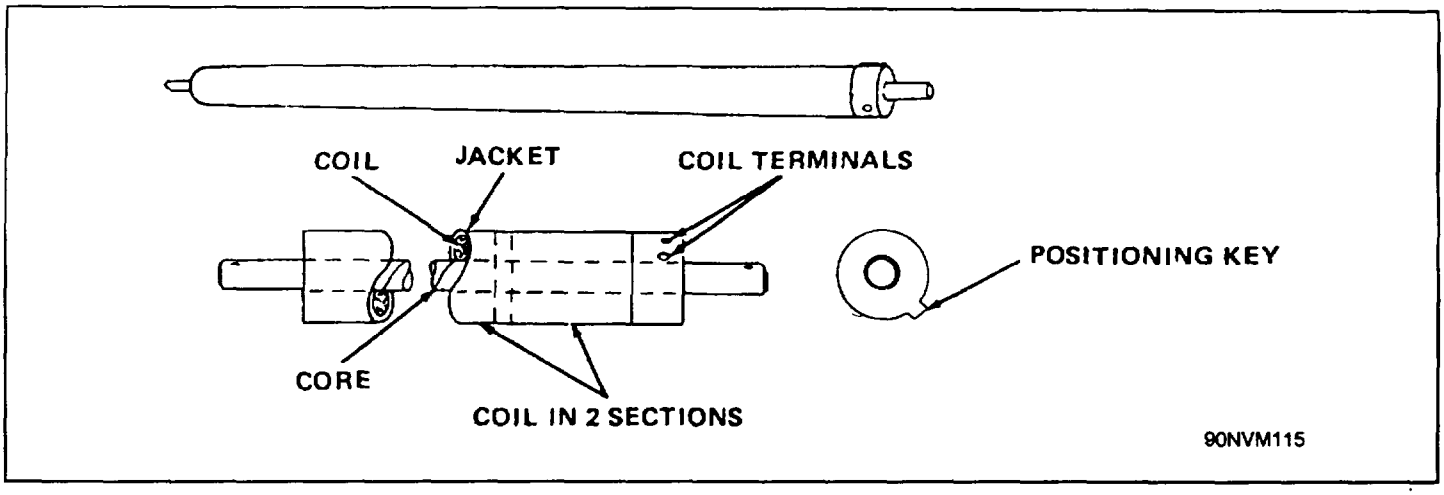


Figure 2-9.—Mk 27 Mod 0 search coil.

magnetic flux along the axis of the search coil caused by a ship's passage produces voltage across the search-coil terminals to produce the input signal to the Mk 20 firing mechanism.

MK 10 MOD 0 ET STERILIZER

The Mk 10 Mod 0 ET sterilizer's sole function is to complete breaks in the mine firing circuit. The unit, shown in figure 2-10, does not contain timing elements since the sterilizing function, which is performed by the elements, is not required in the Mk 52 and Mk 55 actuation mines.

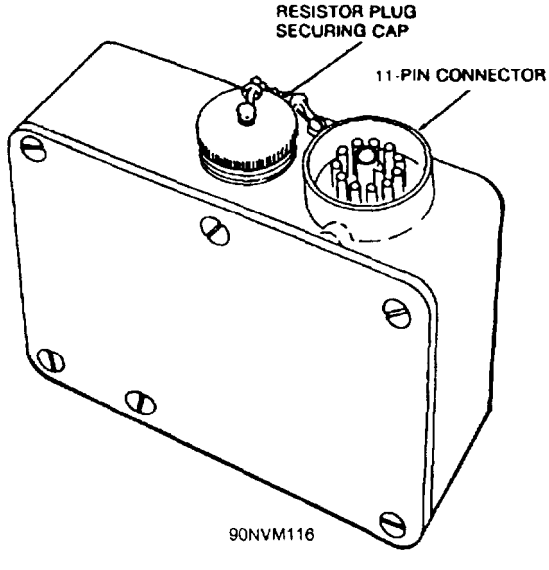


Figure 2-10.—Mk 10 Mod 0 ET sterilizer.

MK 39 MOD 1 CONTROL BOX

The Mk 39 Mod 1 control box is an electromechanical timing and switching device housed in an orange aluminum-alloy case measuring 4 1/2 inches high, 6 inches long, and 4 1/2 inches wide. It controls the overall operation of the mine in its armed condition.

The unit consists of 10 motor-driven cams mounted on a common shaft, which rotates through a series of speed-reduction gears at one-half revolution per minute (rpm). Cam-following switches open and close circuits at intervals fixed by the cam's design. One revolution of the shaft, completing a full control-box cycle, requires 2 minutes.

MK 35 MOD 0 JUNCTION BOX

The Mk 35 Mod 0 junction box, shown in figure 2-11, is an olive-drab aluminum box that installs in the instrument rack to join the leads from various points in the mine's circuitry to a single 30-pin socket test receptacle.

The test receptacle, positioned at a cutout in the forward end of the rack, is accessible through the arming-device well for checking the assembled mine's operation.

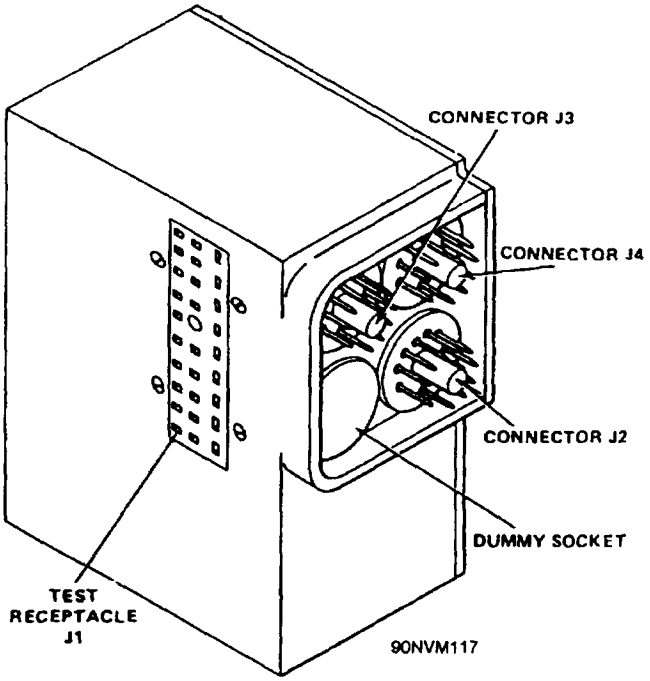


Figure 2-11.—Mk 35 Mod 0 junction box.

MS3314 AND MK 3 SUSPENSION LUGS

MS3314 and Mk 3 suspension lugs used on the Mk 52 and Mk 55 actuation mines, respectively, may be reused for all flight operations if, upon inspection, they exhibit no damage to the threads or to the suspension arch. Moreover, these lugs may be reused on nonflight actuation mines if they exhibit no structural defects and are painted red to distinguish them from serviceable units.

MK 3 INSTRUMENT RACK

The Mk 3 instrument rack provides a housing for most of the components, including batteries, within the mine case. The rack comprises a center section, a battery strap, an instrument strap, a cap, a cover, and the necessary hardware to hold it together. The center section divides the rack into two compartments with batteries in one compartment and components (and a few batteries) in the other. The straps secure the batteries and the components to the center section as a unit.

MK 17 MOD 0 DRILL FLOAT

The Mk 17 Mod 0 drill float, shown in figure 2-12, is used on the Mk 52 and Mk 55 actuation mines to mark their underwater locations (after actuation) and thus facilitate recovery. The float incorporates a signal tube, a tapped hole for an explosive fitting, and a tapped hole for a signal-retaining screw. The float also contains a 200-foot nylon line, which is made fast to the mine until recovery; a 2-foot nylon mooring line, which holds the float submerged until the mine is actuated; and a pipe plug, which can be removed to leak-test the float.

When assembled with a signal, an explosive fitting, and a cap for sealing the signal tube, the Mk 17 float installs into a drill shield, which secures to the tail section of the mine. After the mine has been planted and a target has been detected, the explosive fitting fires and ejects the signal from the float with enough force to shear the rivets that secure the sealing cap in place. A coiled spring, installed in the signal tube, completes the ejection process.

Following the ejection from the signal tube, the signal rises to the surface of the water to emit smoke and flame to indicate that the mine has actuated. After the mine actuation phase and following a predetermined period of time (as set on the Mk 64 switch delay), an explosive fitting in the shield fires and causes the mooring line to be cut, permitting the float to rise to the surface with its recovery line and to mark the location of the submerged mine.

DRILL FLOAT SHIELD ASSEMBLY

The drill float shield assembly, shown in figure 2-13, is a steel cylinder, open at both ends, measuring 13 inches long and 19 inches in diameter. The shield attaches to the tail of the mine and provides the housing for the exercise gear (float, signal, delay switch, etc.). The aft end of the shield has three concave supports welded around its inner circumference and to the bulkhead, upon which the Mk 17 float is positioned. The supports are rubber coated to prevent damage to the float. Mounted in

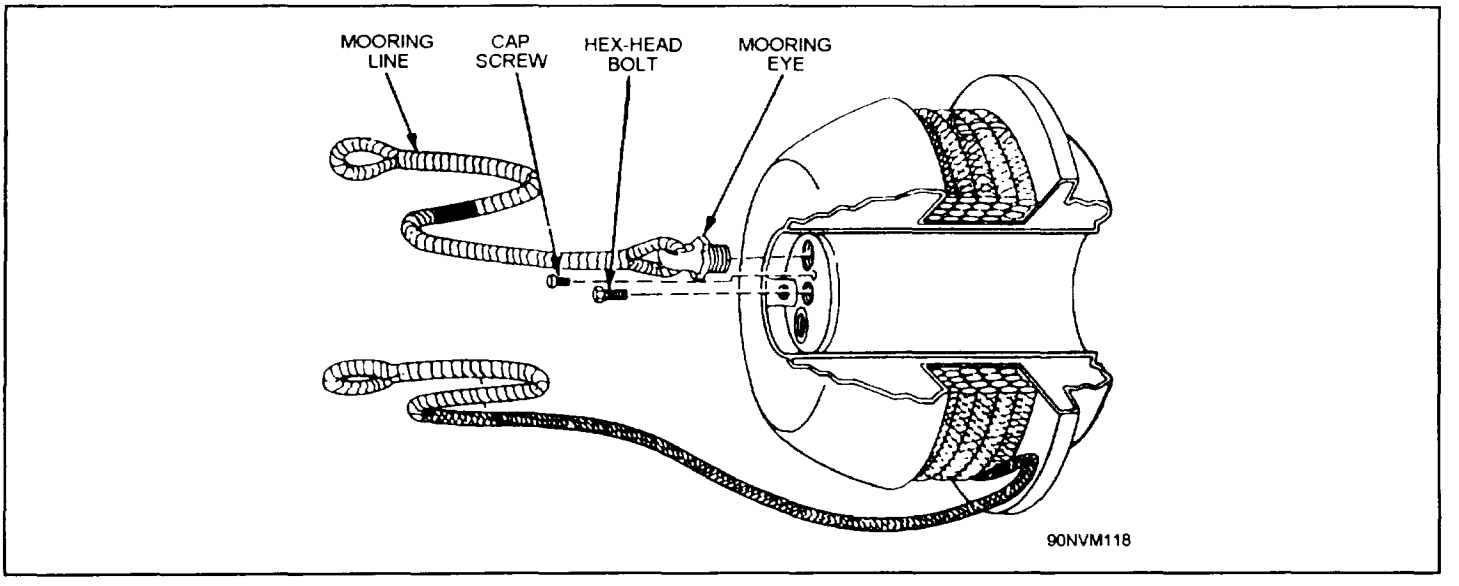


Figure 2-12.—Mk 17 Mod 0 drill float.

the shield are three float-ejection springs, a cable-cutter housing, and a delay-switch housing. The float-ejection springs are placed around the inner circumference of the shield about 6 1/2 inches from the aft end, and are secured to the outer wall of the shield by roll pins and welded brackets. The cutter housing and the delay-switch housing are mounted to the shield bulkhead about 5 inches from the forward end.

MK 115 AND MK 116 MODS 0 AND 1 SMOKE AND ILLUMINATION MARINE SIGNALS

The Mk 115 and Mk 116 signals, shown in figure 2-14, provide a visual indication of mine/simulator actuation, Both signals are identical, except that the Mk 115 produces a yellow smoke and flare display, and the Mk 116 produces a green display. The signals are made of aluminum and measure 9 1/2 inches long and 3 13/16 inches in diameter, and weigh 2 2/3 pounds. They comprise two main assemblies: a shell assembly and a base assembly.

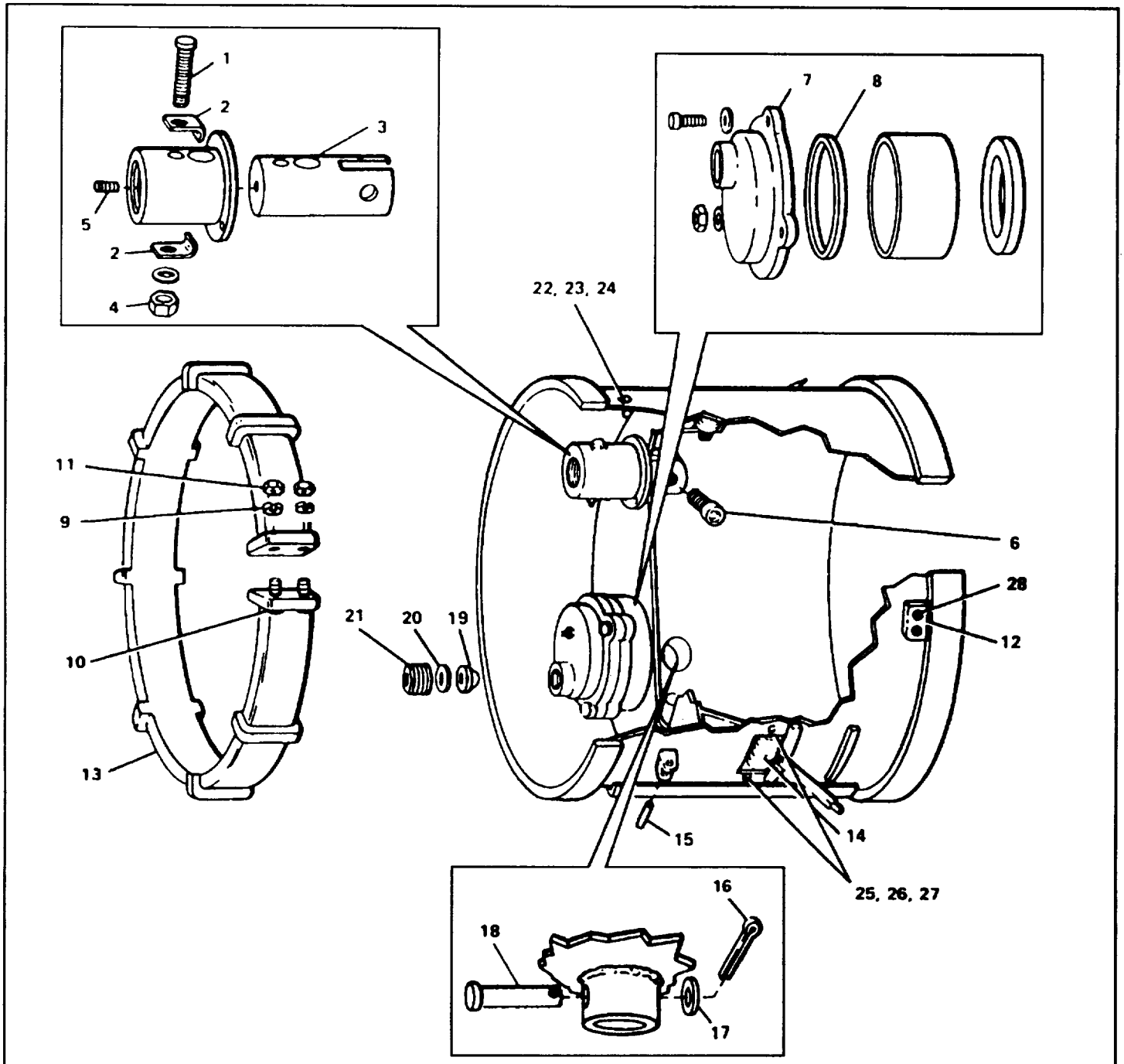
- The shell assembly contains chemicals for producing smoke and flame, an electric squib, and an orifice plug.

- The base assembly contains a seawater-activated battery, a large coil spring, a small coil spring, a sealing disc, and an arming button, which is held safe in a locking cam by the force of the large coil spring.

The Mod 1 signals are essentially the same as the Mod 0, except that the Mod 1 incorporates a redesigned sealing disc, which centers the axis of the large coil spring; a change in design of the detent slot in the signal's base to improve the arming function; a redesigned large coil spring; and a redesigned arming button.

In the storage condition, a protective cap secures to the base assembly. In use, the signals install in the Mk 17 float and are ejected by an explosive fitting. Upon initiation of the ejection mechanism, the signal becomes armed as the arming button is forced out of its locking cam, allowing it to jettison as it exits the float.

As the signal makes its ascent, the sealing disc is held fast by hydrostatic pressure until it reaches a given point near the water surface. At this point, the force of the small spring exceeds hydrostatic pressure and jettisons the sealing disc, allowing seawater to enter and activate the battery. Activation of the battery fires the electric squib which, in turn,



1 SHEAR BOLT
2 CABLE CLIP
3 CABLE CUTTER
4 SELF-LOCKING HEX NUT
5 SETSCREW
6 MOORING-LINE SECURING SCREW
7 SWITCH DELAY HOUSING COVER
8 PREFORMED PACKING
9 LOCK WASHER
10 CAP SCREW
11 HEX NUT
12 ANTIROTATION BLOCK
13 HALF BAND
14 FLOAT-EJECTOR SPRING

90NVM119

15 ROLL PIN
16 COTTER PIN
17 FLAT WASHER
18 CLEVIS PIN
19 PACKING GLAND
20 GLAND WASHER
21 GLAND PLUG
22 CABLE CLAMP
23 MACHINE SCREW
24 SELF-LOCKING NUT
25 MACHINE SCREW
26 LOCK WASHER
27 HEX NUT
28 SELF-LOCKING SCREW

Figure 2-13.—Drill float shield assembly.

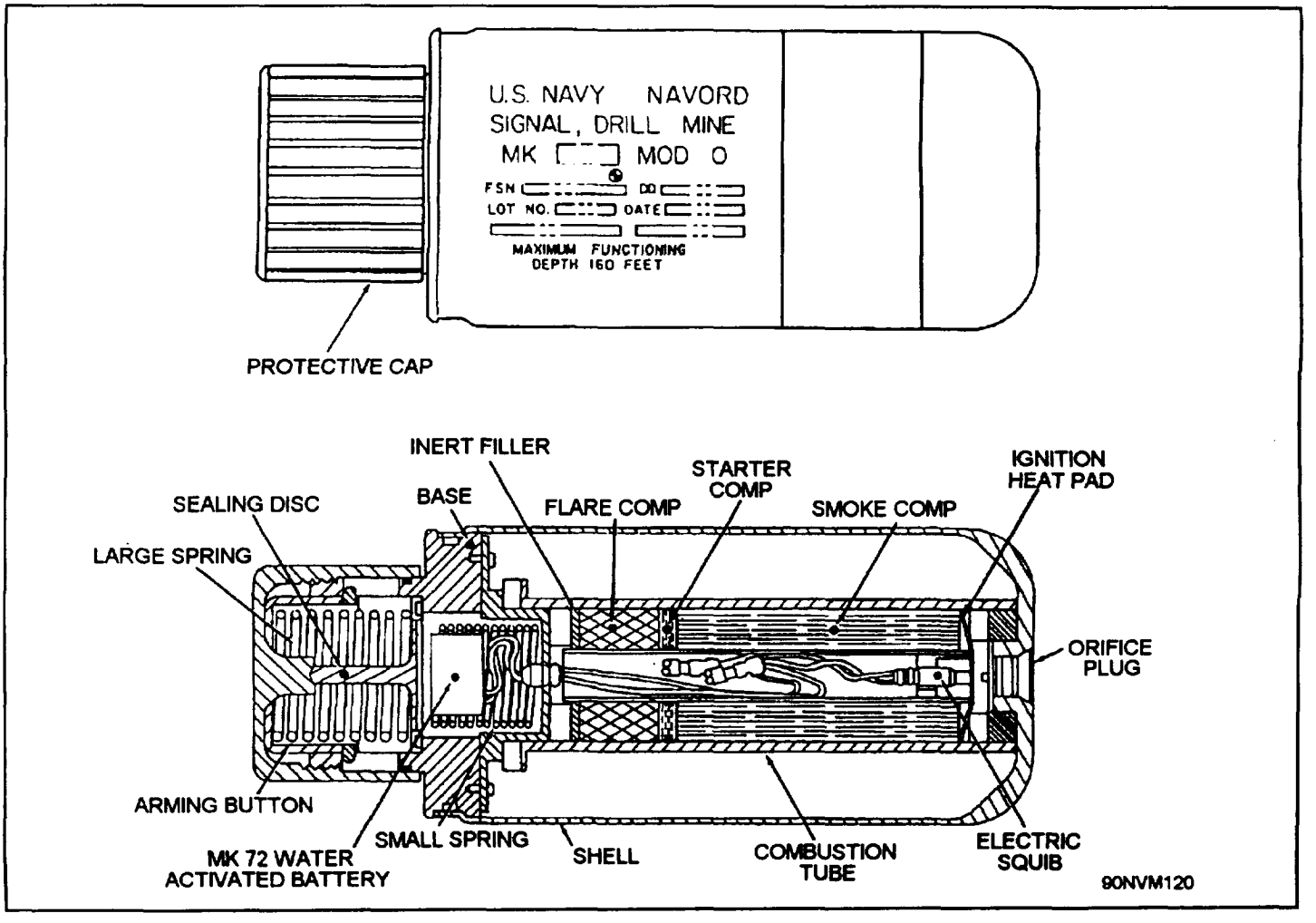


Figure 2-14.—Mk 115 and Mk 116 smoke and illumination marine signals.

ignites the chemicals. The pressure created by the burning chemicals blows the orifice plug, releasing smoke for about 70 seconds, followed by flame for about 25 seconds.

MK 125 MOD 0 SMOKE AND ILLUMINATION SIGNAL

The Mk 125 Mod 0 signal, shown in figure 2-15, provides a visual indication of a mine actuation by a white smoke and flare display on the water's surface. It measures 10 inches long and 3 3/4 inches in diameter, and weighs approximately 2 1/2 pounds. The signal consists of a cylindrical aluminum shell attached to an aluminum base. The shell contains a combustion tube with smoke and flame-producing chemicals, an electric squib, and an orifice plug. The base contains a seawater-activated battery, a large coil spring, a small coil spring, a sealing disc, and an arming button, which is held safe in a locking cam by the force of the large coil spring.

In the storage condition, a protective cap fastens to the base assembly. In use, the signal installs in the Mk 17 float and is ejected by an explosive fitting. Upon initiation of the ejection mechanism, the signal becomes armed as the arming button is forced out of its locking cam, allowing it to jettison as it exits the float. As the signal makes its ascent, the sealing disc is held fast by hydrostatic pressure until it reaches a given point near the water surface. At this point, the force of the small spring exceeds hydrostatic pressure and jettisons the sealing disc, allowing seawater to enter and activate the battery.

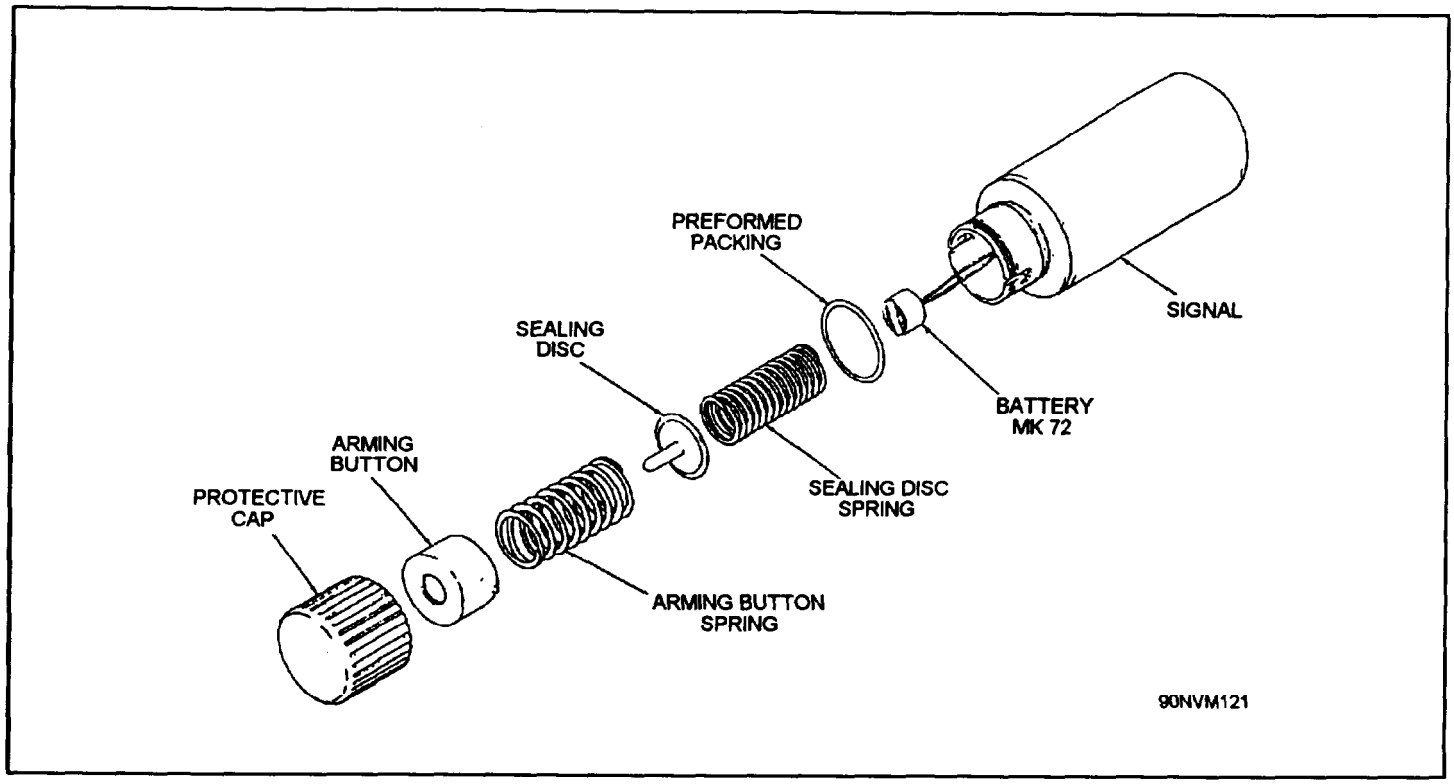


Figure 2-15.—Mk 125 Mod 0 smoke and illumination signal.

Activation of the battery fires the electric squib which, in turn, ignites the chemicals. The pressure created by the burning chemicals blows the orifice plug, releasing white smoke and flame.

MK 64 MOD 3 SWITCH DELAY

The Mk 64 Mod 3 switch delay, shown in figure 2-16, functions at a preset time to fire an explosive fitting that drives a cutter which, in turn, severs a mooring line restraining the submerged float, thus allowing it to rise to the surface with its recovery line. The operating components of the switch delay are contained in a circular, two-piece plastic housing consisting of a main section and a cover secured together with four screws.

When assembled, the housing is 2 inches high and 4 inches in diameter. The housing incorporates a Mk 63 hydrostatic switch and two rotary selector switches wired to 13 resistors for making time delay settings from 1 to 49 days. The housing also accommodates the Mk 1 timing element and the Mk 135 battery.

In a planted mine, the switch delay functions as follows: The Mk 63 hydrostatic switch operates at a depth of 12 feet and applies current from the Mk 135 battery to the Mk 1 timing element.

Upon expiration of the time-delay period, as set on the selector switches, the timing element operates by releasing a spring-loaded plunger, which closes a circuit to fire an explosive fitting. The firing of the fitting releases a float attached to a nylon line.

Upon surfacing, the float marks the location of the mine, which is then recovered. It should be noted that the Mk 64 switch delay functions as a safety mechanism if the mine is recovered prematurely and if the switch delay has not fired the explosive fitting that releases the float.

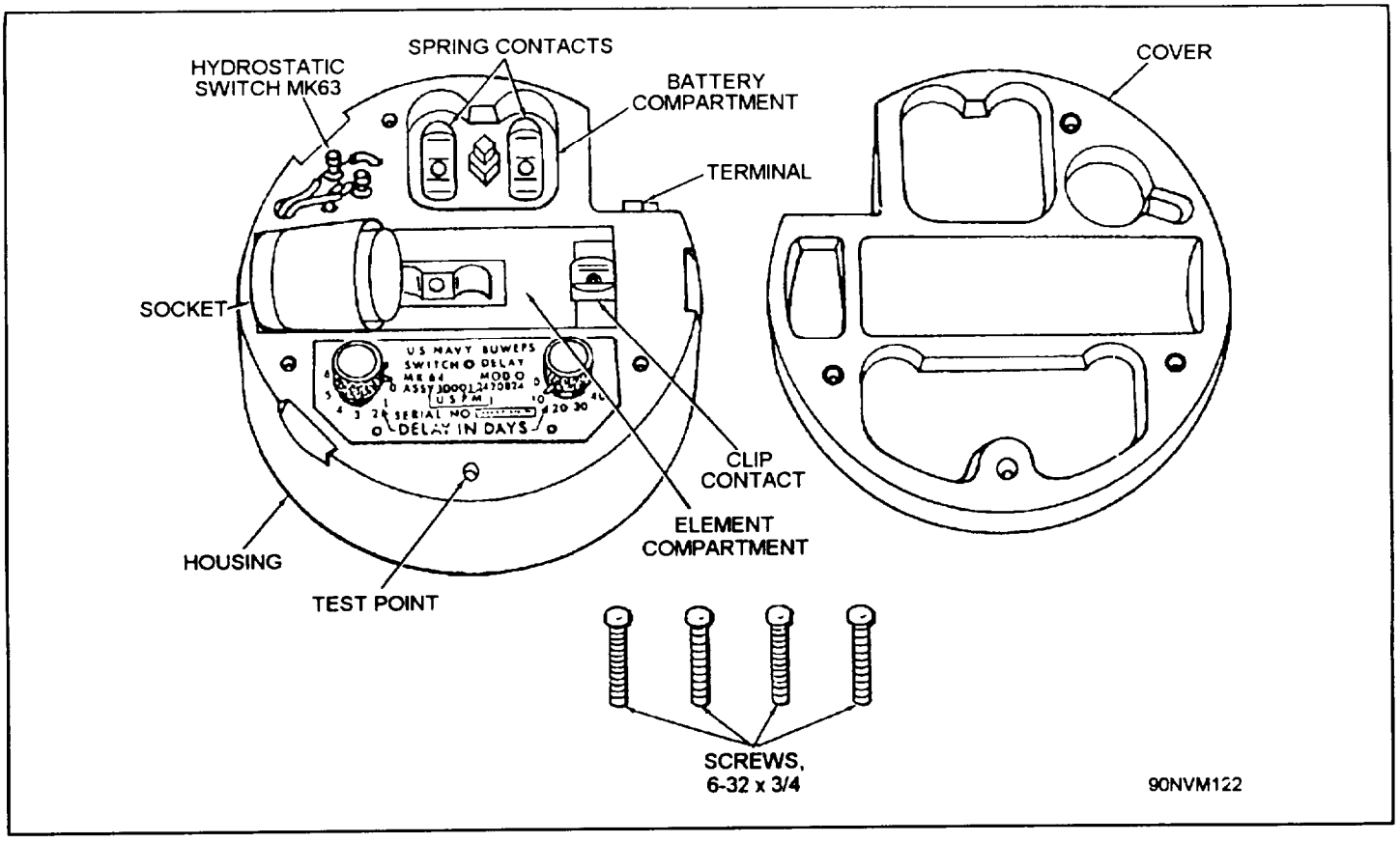


Figure 2-16.—Mk 64 Mod 3 switch delay.

MK 19 MOD 1 EXPLOSIVE FITTING

The Mk 19 Mod 1 explosive fitting, shown in figure 2-17, is an electrically initiated explosive device used to release the recovery float and to cut the electrical cable to the Mk 20 explosive fitting. The fitting consists of a flexible cable and an explosive actuator in a hexagonal steel housing. The threaded end of the housing has a plastic dust cap to protect the threads. A binding-post spring is a safety clip used during handling, shipping, and storage. The threaded end of the explosive fitting is screwed into the cutter housing, and the opposite end is plugged into the Mk 64 switch delay. Upon receipt of an electrical impulse from the switch delay, the explosive actuator is initiated which, in turn, actuates the cutter. The cutter severs the cable of the Mk 20 explosive fitting and releases the mooring cable by shearing a 1/4-inch bolt, allowing the float to rise to the surface.

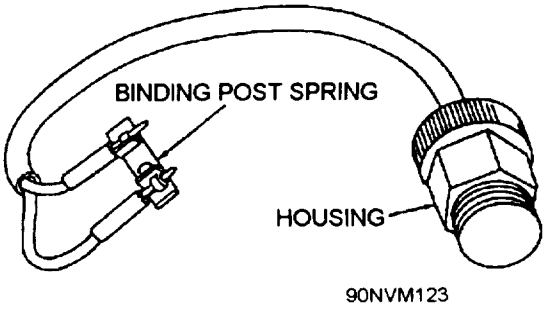


Figure 2-17.—Mk 19 Mod 1 explosive fitting.

MK 20 MOD 0 EXPLOSIVE FITTING

The Mk 20 Mod 0 explosive fitting, shown in figure 2-18, is an electrically actuated explosive device used in the float to release the smoke signal that indicates mine actuation. The fitting consists of a hexagonal actuator and a connecting 59-inch cable, terminating in a 2-pin male connector. The threaded

end of the housing attaches to the float and connects to the smoke signal; the 2-pin male connector plugs into the CA-465 cable assembly in the tail cover of the mine. Upon receipt of an electrical impulse, the explosive actuator in the fitting is initiated and drives the signal into the punch cap, shearing the rivets securing the punch cap and tearing out a section from the base. The signal is then free to rise to the surface.

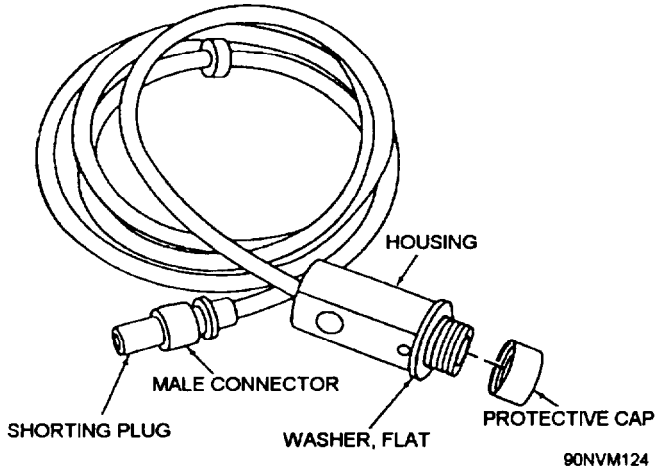


Figure 2-18.—Mk 20 Mod 0 explosive fitting.

MK 25 MOD 0 SIGNAL DATA RECORDER

The Mk 25 Mod 0 signal data recorder, shown in figure 2-19, is a small, rugged, completely self-contained, solid-state device capable of recording the date, the time of day, and the source of repetitive electrical input signals from multiple sources over an extended time frame. Measuring 3 1/2 inches high and 2 1/2 inches in diameter, the recorder is constructed of cylindrically shaped, black molded material. It is watertight and has a single 37-pin electrical connector for testing the system interface.

The recorder has one threaded hole near the center of the end plate for mounting purposes and is self-powered by two internally mounted replaceable batteries. Totally solid-state in design, the recorder contains a presettable crystal oscillator-based clock as a reference and monitors up to four independent signal inputs for a period in excess of 30 days. A voltage pulse or level increase on any one or more of the input channels initiates a record sequence or an event that results in the date and the time of day being entered into a solid-state, random-access memory (RAM), along with coded information to identify the signal source. The memory has a capability to store up to 143 recorded sequences or events.

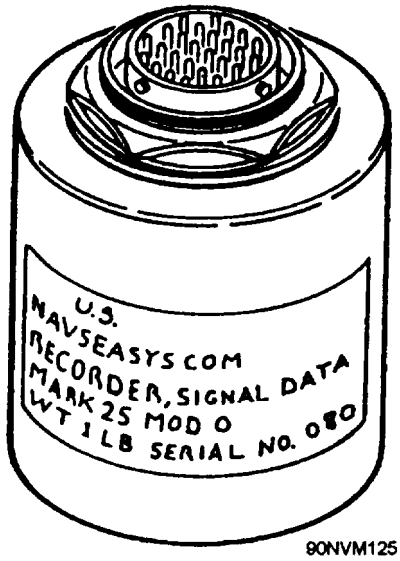


Figure 2-19.—Mk 25 Mod 0 signal data recorder.

MINE-CASE TAIL COVERS

The tail covers used on the Mk 52 and Mk 55 actuation mines, shown in figure 2-20, are secured to the mines by 24 socket-head screws. The covers contain three large holes, about 5 inches in diameter, which accommodate the components for the influence mines. Blanking plates and preformed packings seal these holes when the components are not installed. The covers also contain a hole that accommodates the CA-465 cable assembly, which connects the instrument rack to the explosive fitting in the shield.

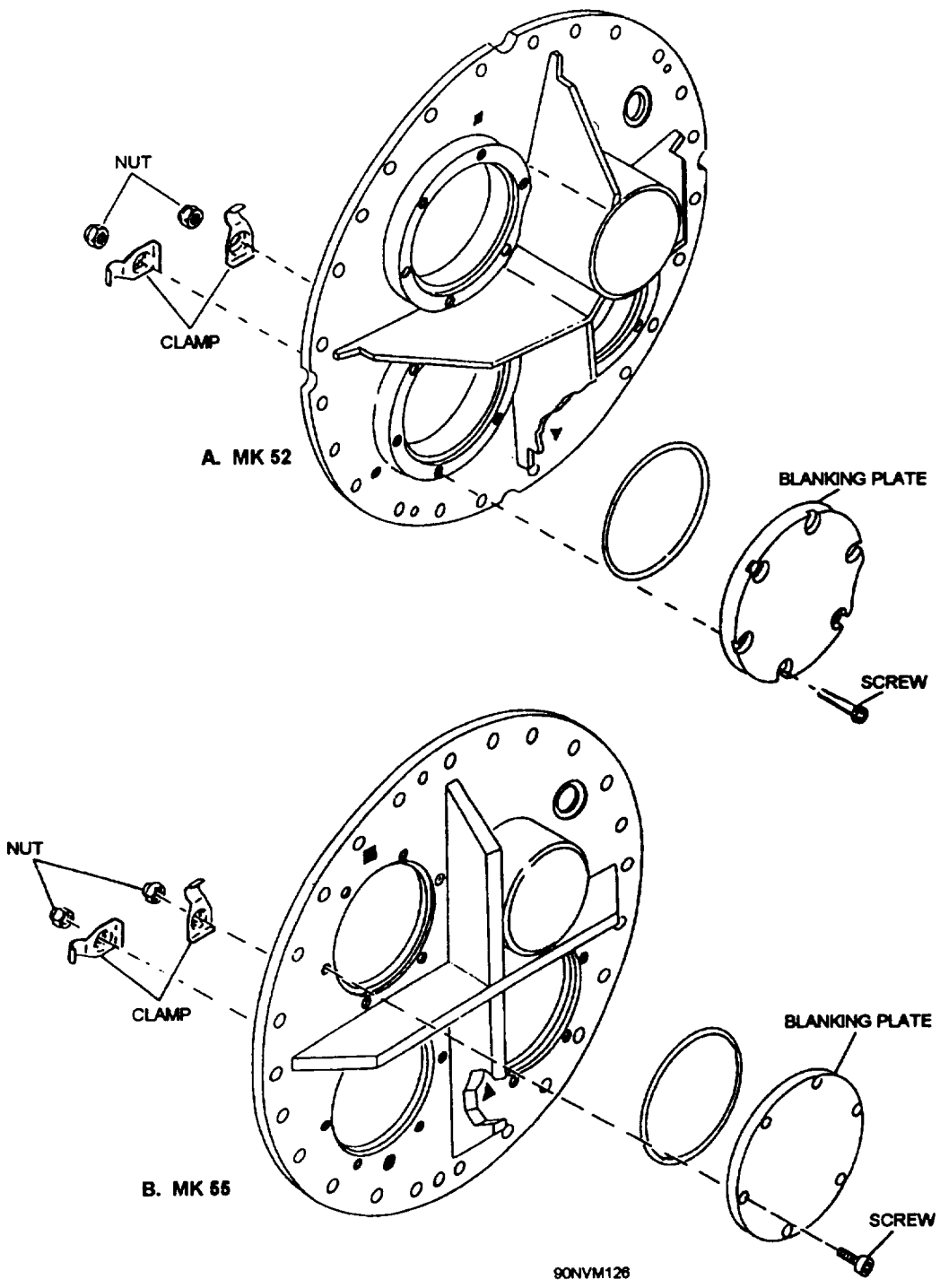


Figure 2-20.—Mine-case tail covers.

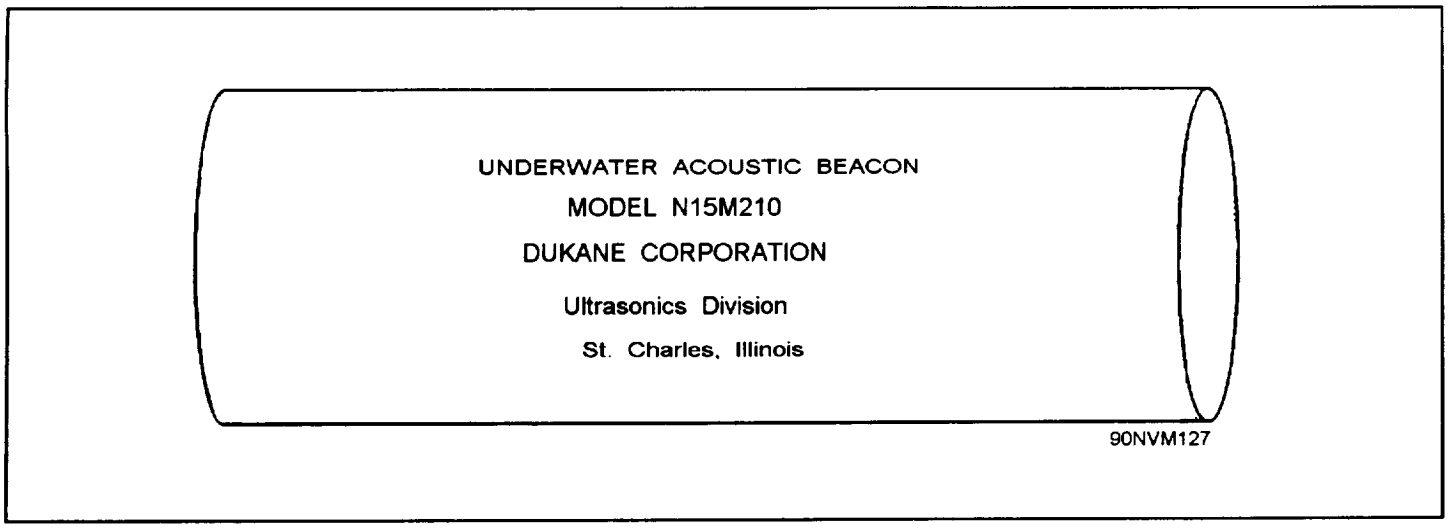


Figure 2-21.—Mk 87 Mod 0 sonar transmitter.

MK 87 MOD 0 SONAR TRANSMITTER

The Mk 87 Mod 0 sonar transmitter, shown in figure 2-21, is used on all actuation mines. It is 3 3/4 inches long and 1 1/4 inches in diameter. Made of stainless steel, the unit is used with a holder that installs externally in the arming device well. It is a rugged, self-contained, battery-powered device that automatically activates when immersed in water. Operating from 35 to 43 kHz, it is capable of transmitting an underwater signal in excess of 2,000 yards for 25 days when the water temperature is above 68 °F.

MK 19 MOD 0 NOSE AND TAIL FAIRING

The Mk 19 Mod 0 nose and tail fairing, shown in figure 2-22, is used on the Mk 52 actuation mine to provide a low-drag profile when the mine is carried externally on high-speed planting aircraft.

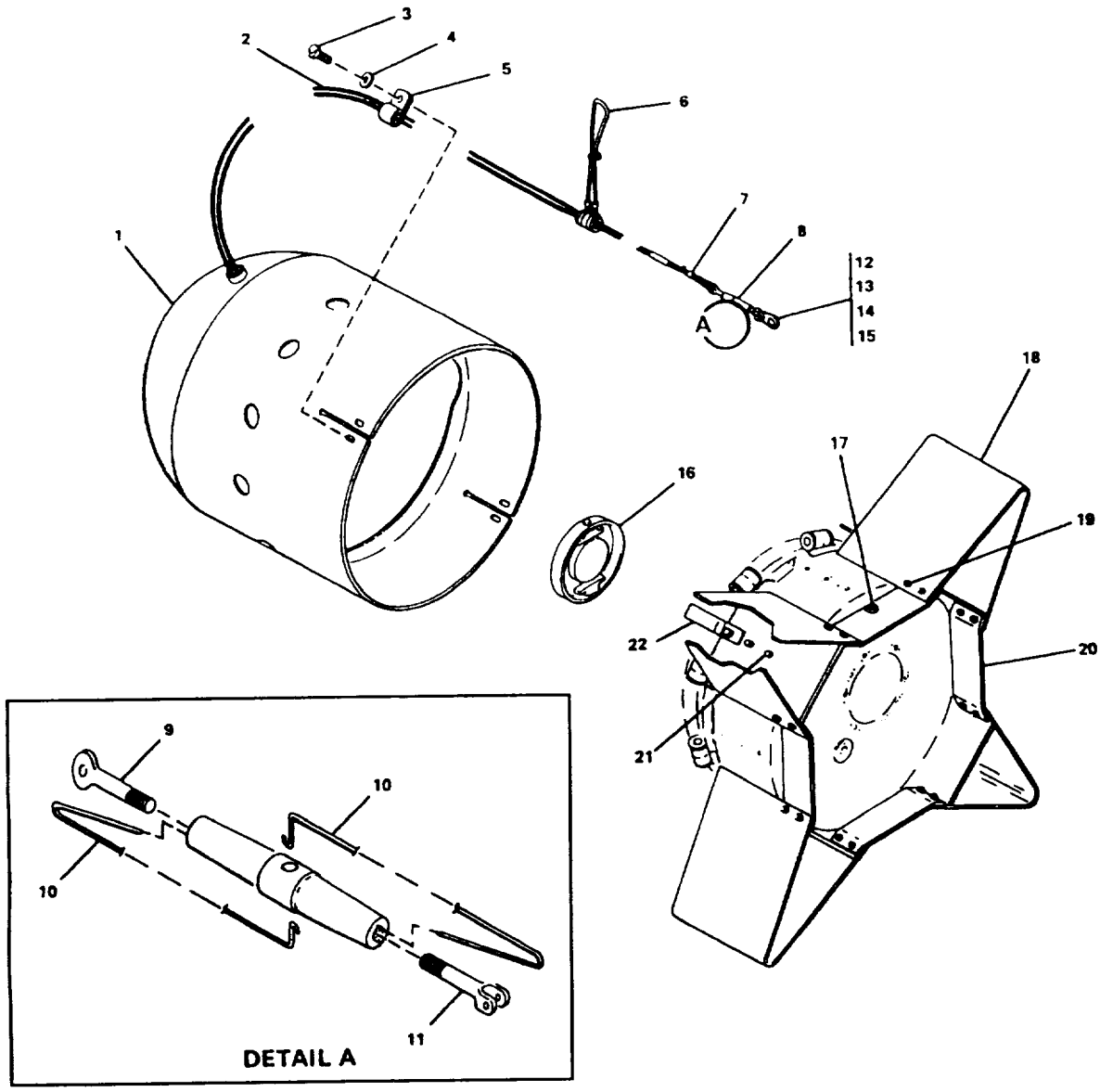
The painted aluminum alloy fairing consists of a retractable nose piece, a control wire, a guide assembly, a turnbuckle, a tail fin, and four parachute-release impact-plate retainers.

The fairing nose piece consists of an aluminum retractable nose and shroud and a spring-loaded retracting mechanism. It is secured to the forward end of the mine by eight screws and lock washers. The retractable nose is secured in the extended position by a ball-lock mechanism.

The control wire consists of two lengths of stainless steel wire, which exit the nose through a grommet. The wires then pass through the guide to the turnbuckle, which is secured to a plate installed on the shroud-line lug to draw up any slack. The guide secures to the aircraft bomb rack to pull the control wire from the retracting mechanism, which causes the nose of the fairing to retract as the mine is released from the aircraft. This provides the mine with a high-drag and stable free-fall configuration until the parachute is deployed.

The tail fin consists of four 30-degree, aluminum, quarter sections that are joined at their bases by four shield sections, which are mounted on the parachute pack. The fin stabilizes the mine on the aircraft during flight and during free fall until parachute deployment.

The four impact-plate retainers are steel straps that mount on the forward edge of the base of each fin section. The forward ends of the retainers rest against the four impact plates on the parachute release to prevent withdrawal of the plates during high-speed carriage. When the parachute pack opens, the pack cover, the tail fin, and the retainers are released from the mine, thus freeing the impact plates to operate upon water impact.



1. Fairing nose piece
2. Control wire
3. Machine screw
4. Lock washer
5. Cushioned loop clamp, .265 hole
6. Guide assembly
7. Ferrule
8. Turnbuckle body
9. Turnbuckle eye-end tie rod
10. Turnbuckle locking clip
11. Turnbuckle clevis-end tie rod
12. Cap screw
13. Flat washer
14. Self-locking hex nut
15. Turnbuckle anchor plate
16. Cap assembly
17. Grommet
18. Quarter fin
19. Machine screw
20. Shield
21. Hex-head cap screw
22. Impact plate retainer

90NVM126

Figure 2-22.—Mk 19 Mod 0 nose and tail fairing.

MK 20 MOD 0 NOSE AND TAIL FAIRING

The Mk 20 Mod 0 nose and tail fairing, shown in figure 2-23, is used on the Mk 55 actuation mine to provide a low-drag profile when the mine is carried externally on high-speed aircraft. The painted aluminum alloy fairing consists of a retractable nose piece, a control wire, a guide assembly, a tail fin, four parachute-release impact-plate retainers, a cable clamp, a T-bolt clamp, and an adapter.

The fairing nose piece consists of an aluminum retractable nose and shroud and a spring-loaded retracting mechanism. It is secured to the forward end of the mine by a strap (T-bolt clamp). The retractable nose is secured in the extended (unoperated) position by a ball-lock mechanism.

The control wire consists of two separate 7-foot lengths of stainless steel wire, which exit the nose through a grommet. The wires then pass through the guide and attach to the adapter and are secured and tightened with the cable clamp. The guide secures to the aircraft bomb rack to pull the control wire from the retracting mechanism; thus, the nose of the fairing retracts as the mine is released from the aircraft. This provides the mine with a high-drag and stable free-fall configuration until the parachute is deployed.

The tail fin consists of four aluminum quarter sections that mount on the parachute pack. The fin stabilizes the mine on the aircraft during free fall until parachute deployment.

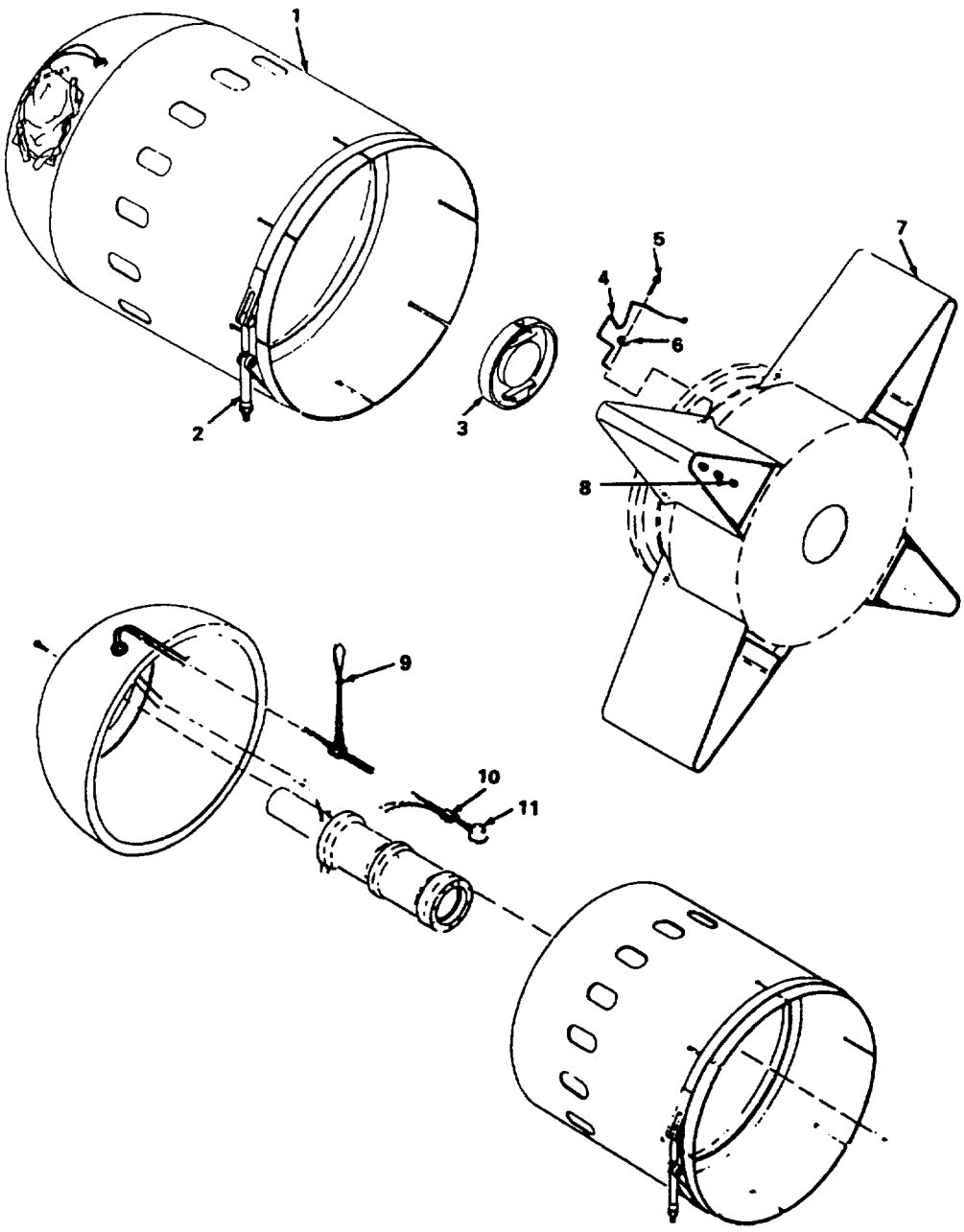
The four impact-plate retainers are preshaped wires installed between the fin sections. They rest against the impact plates on the parachute release to prevent withdrawal of the plates during high-speed carriage. When the parachute pack opens, the pack cover, the tail fin, and the retainers are released from the mine, thus freeing the impact plates to operate upon water impact.

MK 35 MOD 0 AND MK 36 MOD 0 PARACHUTE PACKS

The Mk 35 Mod 0 parachute pack, shown in figure 2-24, is used on the Mk 52 actuation mine. The pack, containing the Mk 30 nylon parachute, attaches to the mine by the Mk 33 parachute release. The housing incorporates a cylindrical, deep-drawn cover that fits into a concave bottom. Eight sets of threaded holes are equally spaced around the periphery of the housing cover for installation of parachute-release impact-plate retainers, the Mk 20 tail fin, or the tail fin assembly of the Mk 19 fairing.

The Mk 36 Mod 0 parachute pack, shown in figure 2-25, is used on the Mk 55 actuation mine. The pack, containing the Mk 29 Mod 1 nylon ring slot parachute, is attached to the mine by the Mk 20 parachute release. The housing incorporates a cylindrical, deep-drawn cover that fits into a concave bottom. Threaded holes are provided around the periphery of the cover for installation of the parachute-release impact-plate retainers and the four wedge-shaped, cruciform, fin quarter sections of the Mk 18 tail fin or the Mk 20 fairing.

An antirotation stop, riveted to the bottom assembly on its circumference, fits over a bolt head, or between two bolt heads, on the tail plate of the mine. This allows the parachute pack to be assembled on the mine case in a number of positions, at 7.5-degree intervals, within an arc extending 45 degrees on either side of the suspension lug center line. Eight parachute suspension line slots are spaced unequally around the bottom assembly, corresponding to the unequally spaced lugs on the Mk 20 parachute release.



1. Fairing nose piece
2. T-bolt clamp
3. Cap
4. Impact plate retainer
5. Machine screw
6. Flat washer
7. Quarter fin
8. Hex-head cap screw
9. Guide assembly
10. Cable clamp
11. Adapter

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Figure 2-23.—Mk 20 Mod 0 nose and tail fairing.

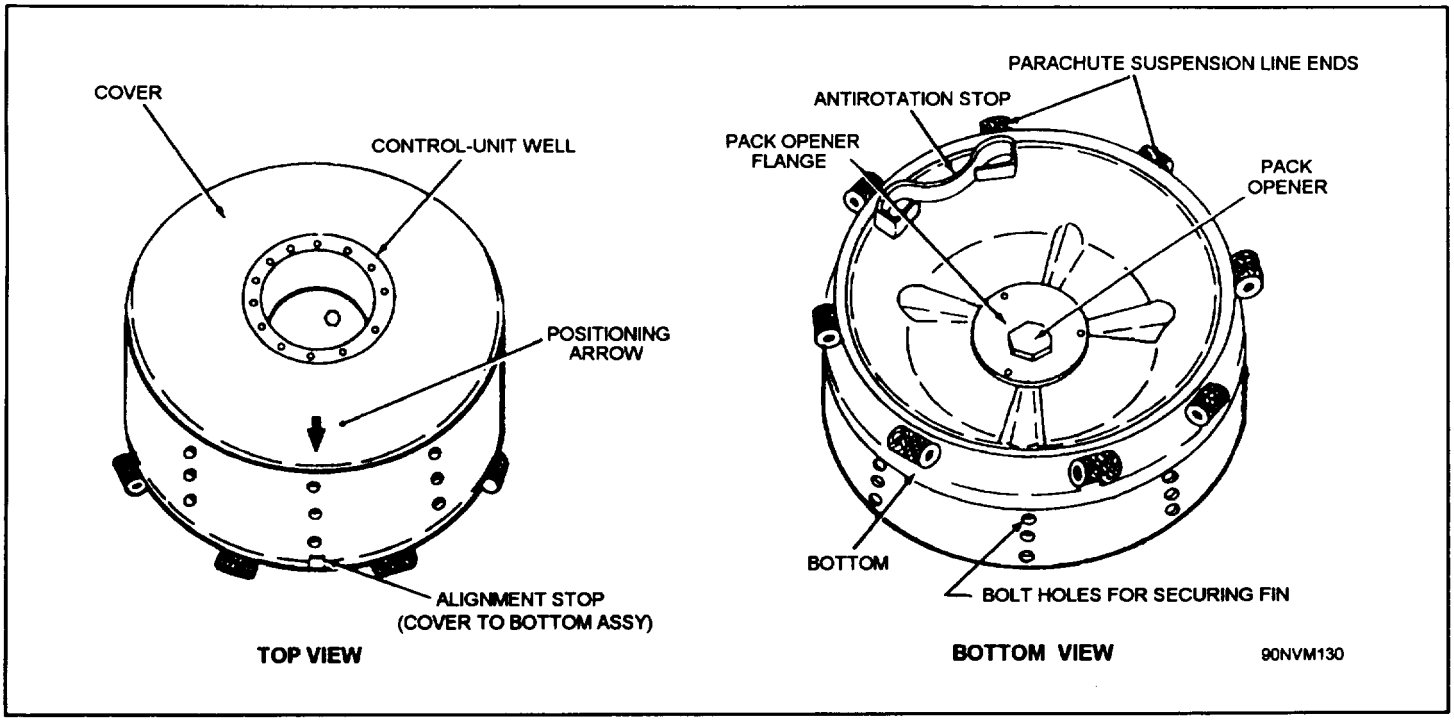

Figure 2-24.—Mk 35 Mod 0 parachute pack assembly.

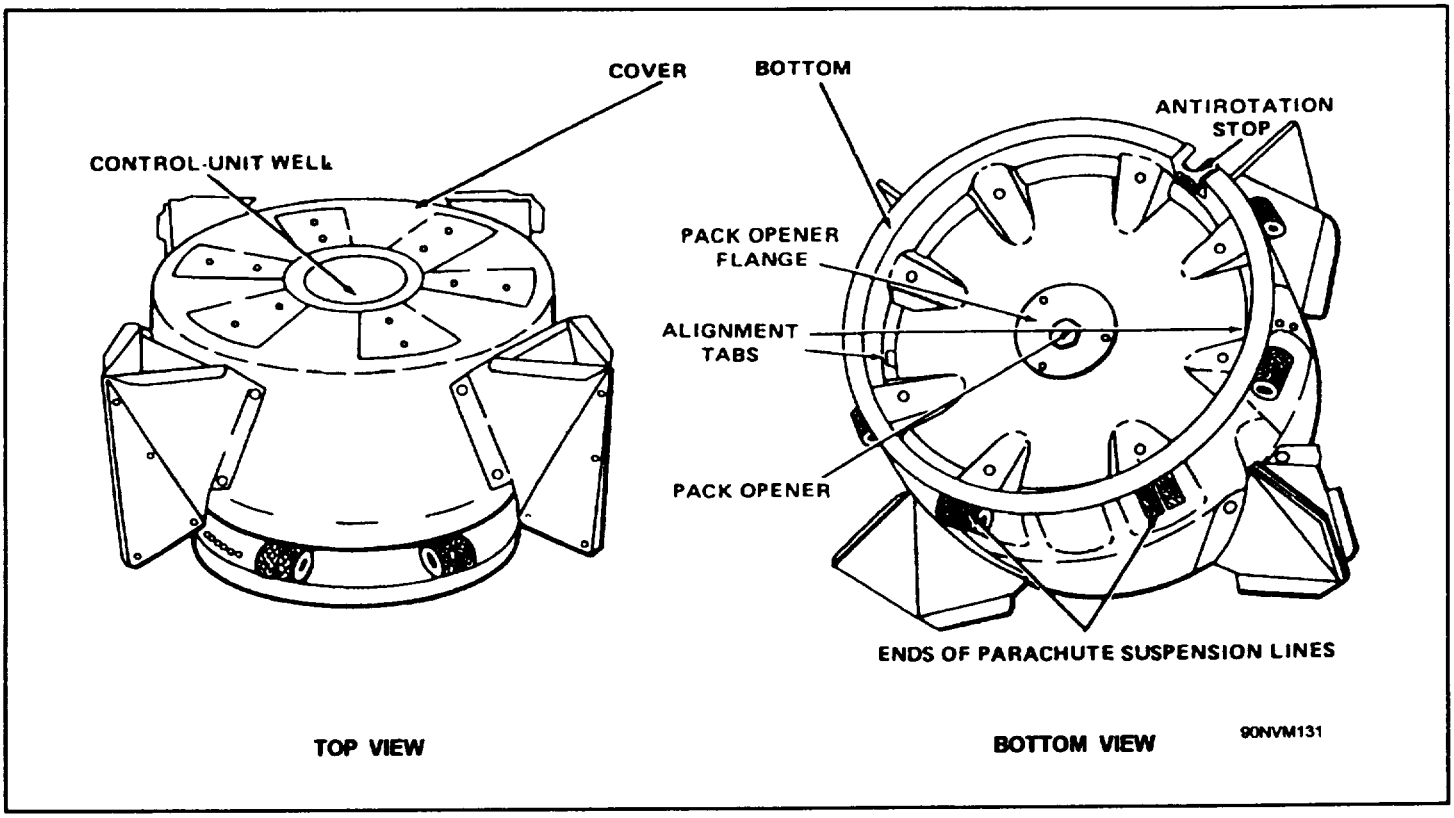

Figure 2-25.—Mk 36 Mod 0 parachute pack assembly.

OPERATIONAL DESCRIPTION

The Mk 52 and Mk 55 actuation mines employ an arming device that contains two hydrostatically operated pistons, the hydrostatic switch piston, and the extender piston, which delay arming until the mine reaches a water depth of approximately 18 feet. The hydrostatic switch piston closes switches in the actuation counter. the clock delay. the sterilizer. and the signal release circuits. The extender piston serves no purpose in the actuation mines. Both of the arming device pistons are held inoperable in the safe position by safety pins.

After the arming device switches operate, the mine is still maintained safe by the clock delay switches that maintain breaks in the actuation counter circuits. These switches in the clock delay close at preset times, from 1 hour to 90 days after operation of the arming device switches.

The sterilizer contains a resistor plug and closes a break in the tiring circuit. It does not limit the armed life of the mine since there are no timing elements installed.

When the mine receives a firing indication, the mine batteries provide a voltage for the electrical explosive fitting, which effects the actuation mine's signal. The mine has a delay switch in the float shield that times the firing of a second electrical fitting, which releases the float from the mine. See figure 2-26.

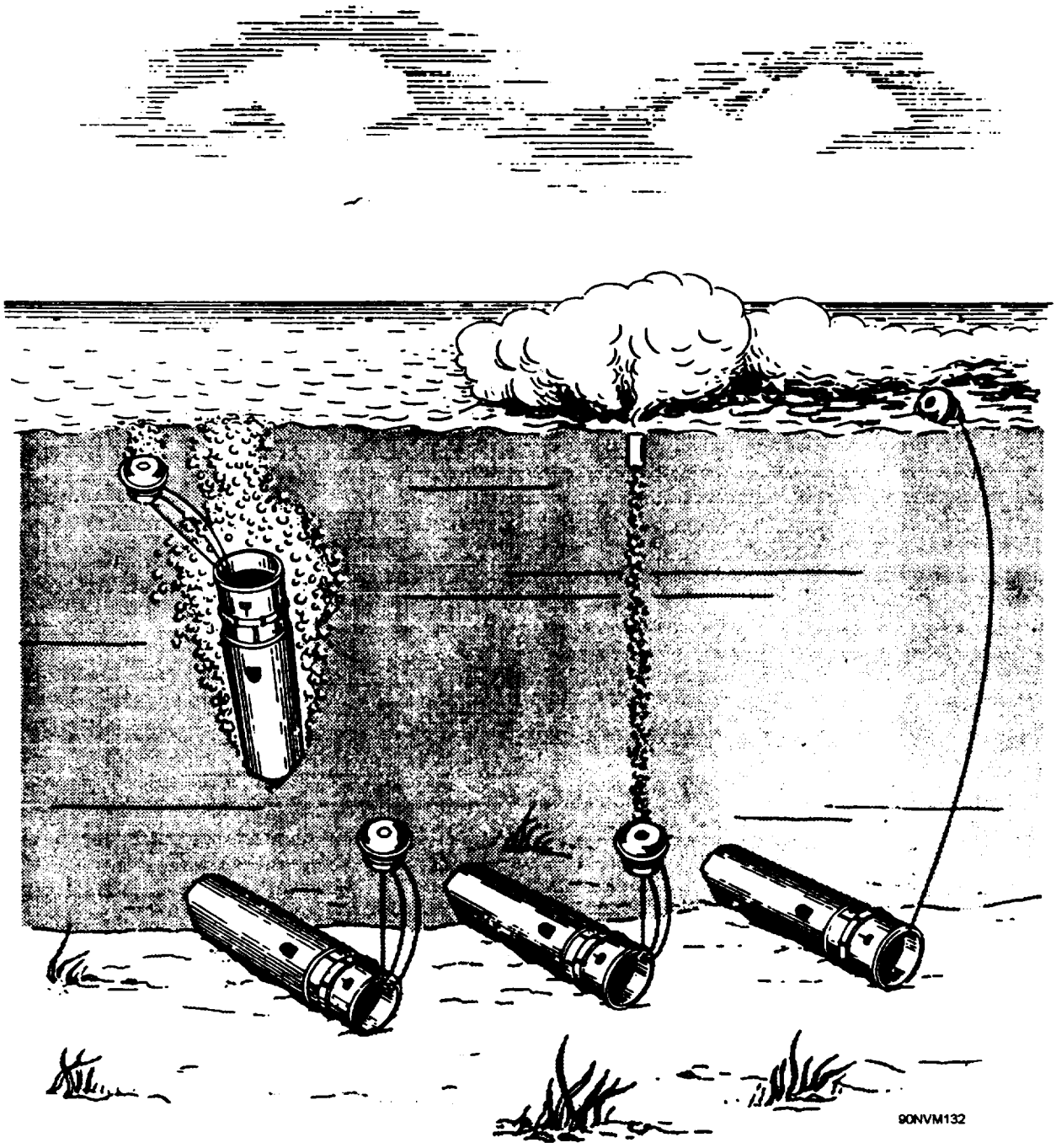

Figure 2-26.—Mk 52 and Mk 55 actuation mines, sequence of operation.

RECOMMENDED READING LIST

NOTE: Although the following references were current when this TRAMAN was published, their continued currency cannot be assured. Therefore, you need to ensure that you arc studying the latest revision.

Mine Components A through C; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-010, Naval Sea Systems Command, Washington, D.C., 1988.

Mine Components D through F; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-020, Naval Sea Systems Command, Washington, D.C., 1988.

Mine Components G through W; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-030, Naval Sea Systems Command, Washington, D.C., 1987.

Mirws, Underwater: Actuation, Description, Assembly, and Tests, NAVSEA SW550-AE-MMI-040, Naval Sea Systems Command, Washington, D.C., 1991.

Mines, Underwater: Exercise and Training; Description and Class-B Criteria, NAVSEA SW550-AE-MMI-010, Naval Sea Systems Command, Washington, D.C., 1989.